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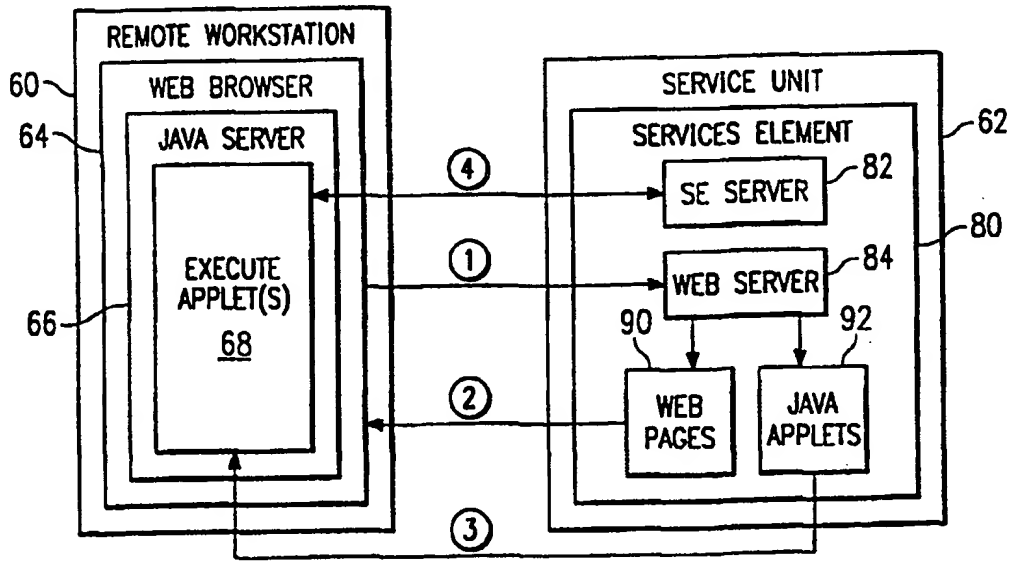
(54) Title: SYSTEM AND METHOD FOR MONITORING AND MANAGEMENT OF TELECOMMUNICATIONS EQUIPMENT USING ENHANCED INTERNET ACCESS



(57) Abstract

A system (20) for monitoring and management of telecommunications equipment (10, 30) in a telecommunications network via the internet (34) is provided. The system (20) includes a plurality of user devices (36, 46, 50) each executing a web browser (64) for communications with the internet (34). An intranet (32) is in communications with the internet (34). A web server (84) identifiable by an internet address resides on each telecommunications equipment (10, 30), where the telecommunications equipment of the telecommunications network are coupled to the intranet (32). A plurality of web pages (90) for displaying monitoring and management information associated with the telecommunications equipment are accessible by the web server (84) via the internet (34) and intranet (32).

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SYSTEM AND METHOD FOR MONITORING AND MANAGEMENT OF TELECOMMUNICATIONS EQUIPMENT USING ENHANCED INTERNET ACCESS

TECHNICAL FIELD OF THE INVENTION

This invention is related in general to the field of telecommunications. More particularly, the invention is related to a system and method for monitoring and management of telecommunications equipment using enhanced internet access.

BACKGROUND OF THE INVENTION

A telecommunications service provider such as MCI typically owns and operates a large number of telecommunications switches and other equipment in the public switched telephone network. These telecommunications switches are generally physically located throughout the United States and the globe to achieve close proximity access to the telephone customers.

Within the telecommunications service provider there may be a central network operations site that has access to all the telecommunications equipment in the network owned by the service provider to perform support, monitoring and management services. These services include billing, and setting up or changing telephone services. The telecommunications equipment are further monitored and

controlled by additional craft personnel who operate out of offices that are physically located closer to the equipment they manage. Other craft personnel may operate out of more remote sites such as their home offices. Typically, a modem-based RS232 ASCII protocol is used for the link up between X-terminals located at the remote sites to the telecommunications equipment. Although graphical user interfaces (GUIs) can be supported by this access scheme, it is excruciating slow because it operates on a bit map or pixel information basis. Thus, a very wide pipe, such as a T1 span, is required to enable even minimally adequate graphical update of screen information and display.

There is a further need to allow the telecommunications equipment manufacturer to have access to the telecommunications equipment for further product support. Generally, the customer support, field service personnel, and engineers do not have access to most or all of the telecommunications equipment operating in the field. This is highly desirable to provide the telecommunications service provider, and, ultimately, the telecommunications customers, the best and responsive maintenance and support possible.

SUMMARY OF THE INVENTION

Accordingly, there is a need to provide enhanced access to telecommunications equipment in the telecommunications network for monitoring and management thereof.

In accordance with the present invention, system and method for monitoring and management of telecommunications equipment using enhanced internet access are provided which eliminate or substantially reduce the disadvantages associated with prior systems and methods.

In one aspect of the invention, a system for monitoring and management of telecommunications equipment using the internet is provided. The system includes a web server residing on the telecommunications equipment, where the web server is identifiable by an internet address. A plurality of web pages containing monitor information associated with the telecommunications equipment are accessible by the web server by specifying an internet address therefor. A web browser application executing on a user device may be connected with the web server using its internet address and to further receive the plurality of web pages therefrom over the internet. The web pages further receive user input and transmit them to the web server.

In another aspect of the invention, a system for monitoring and management of telecommunications equipment in a telecommunications network via the internet is provided. The system includes a plurality of user devices each executing a web browser for communications with the internet. An intranet is in communications with the internet. A web server identifiable by an internet address resides on each telecommunications equipment, where the telecommunications equipment of the telecommunications network are coupled to the intranet. A plurality of web pages for displaying monitoring and management information associated with the telecommunications equipment are accessible by the web server via the internet and intranet.

In yet another aspect of the invention, a method for monitoring and management of telecommunications equipment in a telecommunications network via the internet is provided. The method includes the steps of connecting a plurality of user devices to the internet, each user device executing a web browser, and connecting the

telecommunications equipment by an intranet to the internet. The telecommunications equipment may be accessed by specifying an internet address of a web server residing on the telecommunications equipment, and downloading a plurality of web pages from the web server via the internet and intranet. The web pages display monitor and management information associated with the telecommunications equipment.

BRIEF DESCRIPTION OF THE DRAWINGS

For a better understanding of the present invention, reference may be made to the accompanying drawings, in which:

FIGURE 1 is a high level block diagram of a distributed telecommunication switching system;

FIGURE 2 is a high level block diagram of apparatus and method for monitoring and management of telecommunications equipment using enhanced internet access according to an embodiment of the present invention;

FIGURE 3 is a more detailed block diagram of an exemplary communications process between a piece of telecommunications equipment and a remote workstation according to an embodiment of the present invention;

FIGURE 4 is an exemplary screen of a web page serving as an entry point into remote access of telecommunications equipment via internet according to an embodiment of the present invention;

FIGURE 5 is an exemplary screen of a web page providing a selection list of telecommunications equipment available for access via internet according to an embodiment of the present invention;

FIGURE 6 is an exemplary screen of a web page providing a selection of available monitoring and

management functionality for access via internet according to an embodiment of the present invention;

FIGURE 7 is an exemplary screen of a web page executing one or more java applets and displaying a list of registered tasks or applications via internet according to the teachings of the present invention;

FIGURE 8 is an exemplary screen of a web page executing one or more java applets and displaying a trace log via internet according to an embodiment of the present invention;

FIGURE 9 is an exemplary screen of a web page executing one or more java applets and displaying the status of an automatic message accounting server via internet according to an embodiment of the present invention;

FIGURE 10 is a portion of an exemplary screen of a web page executing one or more java applets and displaying a morning report via internet according to an embodiment of the present invention; and

FIGURE 11 is a block diagram of exemplary server processes running in the services element according to an embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

The preferred embodiment(s) of the present invention is (are) illustrated in FIGURES 1-11, like reference numerals being used to refer to like and corresponding parts of the various drawings.

Referring to FIGURE 1, a distributed telecommunications switching system 10 is shown. Distributed telecommunications switching system 10 includes a service unit 12 that preferably provides control and management on an advanced intelligent network (AIN) service

platform using information network architecture (INA) software design principles. Distributed telecommunications switching system 10 further includes at least one delivery unit 14 that provides the message transport mechanism for call information under the control and direction of service unit 12. Service unit 12 and delivery units 14 may communicate with one another through a fiber optic or wire-based ring 16. Call information is preferably transported between delivery units 14 and service unit 12 in asynchronous transfer mode (ATM) cell format. Delivery units 14 may operate in a broadband, wideband, narrowband, or a combination of these speeds and formats. For a more detailed description of distributed telecommunications switching system 10, please refer to U.S. Patent 5,495,484, titled *Distributed Telecommunications Switching System*, issued to Self et al. on Feb. 27, 1996, which is incorporated herein by reference.

To provide maintenance and management of distributed telecommunications switching system 10 and other telecommunications equipment 30 in the telecommunications network, access thereto is provided through a telecommunications services provider's intranet 32 and the internet 34. Through internet 34 and intranet 32, telecommunications services provider's operations and support personnel 36 at various sites may access, monitor and control any of the telecommunications equipment. This may include personnel who operate out of home offices 46 or sites remote from a centralized network operations site 38, or customer support and craft sites 40 and 42. Further, personnel 50 of the telecommunications equipment manufacturer, such as customer support 52, field service 54, and development/engineering 56, may also access and provide maintenance and support of telecommunications

equipment operating in the network through internet 34 and intranet 32.

Referring to FIGURE 3, a remote workstation 60 may communicate with a piece of telecommunications equipment such as service unit 62 via internet 34 and intranet 32 (FIGURE 2). Remote workstation 60 may be a personal computer, lap top computer, notebook computer, workstation, and any other computing platform that is capable of executing a web browser program 64, preferably one that is Java-enabled, such as the Netscape Navigator™ and Microsoft Explorer™. When a web browser 64 is Java-enabled, it includes a Java server or engine 66 that enables it to execute Java applets or application programs 68.

Service unit 62 includes a services element (SE) 80 which is a process manager that controls and manages all the servers running in service unit 62, including a services element server 82 and a web server 84. Services Element 80 further includes web pages 90 in a specialized language, such as hyper-text markup language (HTML), and Java applets 92 that provide the context and application programs to monitor and control service unit 62.

In operation, workstation 60 dials up to an internet service provider with a modem (not shown) to obtain an internet connection. The craft personnel connects with web server 84 by supplying its web address or uniform resource locator (URL) to web browser 64. When a connection with web server 84 is made, a home web page may be displayed with access options. The craft personnel may specify a specific web page 90 by supplying its address or by clicking on an access option displayed on the home web page (action 1). Web server 84 looks up and sends the requested web page, which is transmitted then displayed on the screen of workstation 60 (action 2). Web server 84 further looks

up and transmits one or more Java applets associated with the requested web page (action 3), which is then executed by Java server 66 on workstation 60. The executing Java applet may perform different functions, one of which is to request specific data or information from services element server 82, such as trace log data for program trace information, information and problem reports (IPRs) for system status information, and automatic message accounting (AMA) status and information for billing purposes. Executing applets 68 may also allow a craft personnel to send command and control data to services element server 82, which may modify or update service unit operations.

Operating in this manner, authorized operations and support personnel of both the telecommunications services provider and equipment manufacturer may access and control the operations of all telecommunications equipment in the network in a fast and efficient manner. This access method is platform independent and only requires the remote workstation to have a Java-enabled web browser to function. Accordingly, problems that surface in the middle of the night may be easily responded to by craft personnel working on home computers. The operations of remote equipment may also be easily maintained and managed. Further, the web pages along with the displayed data can be easily printed to obtain hard copy information of the telecommunications equipment.

It may be seen that network security issues must be addressed, and that security measures such as fire walls and the like may be used to ensure only personnel with the proper authorization may access in this manner.

FIGURE 4 is an exemplary home page that provides access to telecommunications equipment in the network. The text "DSC Megahub™ Sites" may be highlighted to show that

it is a hyper link to another web page, which is shown in FIGURE 5. FIGURE 5 provides a list of hyper links to a number of telecommunications equipment, more specifically, telecommunications switches, that are in the network and available for access. The craft personnel may select a specific equipment by clicking on its name, which brings up a subsequent web page, shown in FIGURE 6. FIGURE 6 provides an exemplary list of functionality available for the selected equipment, which includes functionality related to a site or service unit, or functionality related to a delivery unit of the site.

FIGURE 7 is an exemplary screen representation of the services element node manager or services element web page, when it is selected. A list of tasks or processes registered with services element is displayed along with attendant information. Where more than one equipment is resident at the same site, the craft personnel may supply a node identifier (ID) and local area network (LAN) controllers to enable the monitoring and management of specific local area network (LAN) segments and communications thereon.

FIGURE 8 is an exemplary screen representation of a web page providing trace message information. Trace logs may be used to gather data during network and equipment troubleshooting sessions, for example. Filters are available to provide several levels or views of trace messages. As it may be seen, the trace function may focus on one or more domains or sub-domains.

Automated message accounting is the function of dumping or transferring call records to tape. FIGURE 9 provides an exemplary screen representation of a web page that provides automatic message accounting monitoring and management. From this web page, a craft personnel may

search for a specific block of call records, and manually dump it to tape, for example.

FIGURE 10 is an exemplary web page of a morning report, also available through internet access according to the teachings of the present invention. Every morning or any other selected time of the day or night, certain specific information about each equipment or site may be collected and reported by Java applets of this web page. An exemplary list of information is shown in FIGURE 10.

Referring to FIGURE 11, it may been that in addition to services element server 82 and web server 84 described above, there may be further provided an automatic message accounting server 500, an information and problem report server 502, and a trace log server 504 that perform the respective functions and provide web server 84 the attendant information displayed by each web page. For a more detailed discussion of automatic message accounting server 500, please refer to U.S. Patent Application Serial No. 08/757,465, titled *Database-Driven Automatic Message Accounting System and Method* (Attorney Docket 036560.1565), incorporated herein by reference.

Although several embodiments of the present invention and its advantages have been described in detail, it should be understood that mutations, changes, substitutions, transformations, modifications, variations, and alterations can be made therein without departing from the teachings of the present invention, the spirit and scope of the invention being set forth by the appended claims.

WHAT IS CLAIMED IS:

1. A system for monitoring and management of telecommunications equipment using the internet, comprising:

a web server residing on the telecommunications equipment, the web server being identifiable by an internet address;

a plurality of web pages adapted to display monitor information associated with the telecommunications equipment and receive user input, the web pages being accessible by the web server and each web page being identifiable by an internet address; and

a web browser application executing on a user device adapted to connect with the web server using its internet address and to further receive the plurality of web pages therefrom over the internet, and to receive the user input and transmit the user input to the web server.

2. The system, as set forth in claim 1, further comprising an automatic message accounting server accessible by the web browser and having a plurality of web pages dedicated to billing information monitoring and management.

3. The system, as set forth in claim 1, further comprising an information and problem report server accessible by the web browser and having a plurality of web pages dedicated to system status information monitoring and management.

4. The system, as set forth in claim 1, further comprising a trace log server accessible by the web browser

and having a plurality of web pages dedicated to program trace information monitoring and management.

5. The system, as set forth in claim 1, further comprising java applets associated with the plurality of web pages, the java applets being downloadable to the user device and executed by the web browser.

6. The system, as set forth in claim 1, wherein the telecommunications equipment is a distributed switching system having a service unit coupled to at least one delivery unit, the web server residing in the service unit.

7. The system, as set forth in claim 1, further comprising an intranet coupling the user device to the web server residing on the telecommunications equipment.

8. The system, as set forth in claim 1, further comprising an automatic message accounting server in communications with the web server and having a plurality of web pages dedicated to billing information monitoring and management.

9. The system, as set forth in claim 1, further comprising an information and problem report server in communications with the web server and having a plurality of web pages dedicated to system status information monitoring and management.

10. The system, as set forth in claim 1, further comprising a trace log server in communications with the web server and having a plurality of web pages dedicated to program trace information monitoring and management.

11. A system for monitoring and management of telecommunications equipment in a telecommunications network via the internet, comprising:

a plurality of user devices each executing a web browser for communications with the internet;

an intranet in communications with the internet;

a web server identifiable by an internet address residing on each telecommunications equipment, the telecommunications equipment of the telecommunications network being accessible by the intranet; and

a plurality of web pages adapted to display monitor information associated with the telecommunications equipment and receive user input, the web pages being accessible by the web server and each web page being identifiable by an internet address.

12. The system, as set forth in claim 11, further comprising an automatic message accounting server accessible by the web browser and having a plurality of web pages dedicated to billing information monitoring and management.

13. The system, as set forth in claim 11, further comprising an information and problem report server accessible by the web browser and having a plurality of web pages dedicated to system status information monitoring and management.

14. The system, as set forth in claim 11, further comprising a trace log server accessible by the web browser and having a plurality of web pages dedicated to program trace information monitoring and management.

15. The system, as set forth in claim 11, further comprising java applets associated with the plurality of web pages, the java applets being downloadable to the user device and executed by the web browser.

16. The system, as set forth in claim 11, wherein the telecommunications equipment is a distributed switching system having a service unit coupled to at least one delivery unit, the web server residing in the service unit.

17. The system, as set forth in claim 11, wherein the plurality of web pages include web pages dedicated to automatic message accounting information for billing information monitoring and management.

18. The system, as set forth in claim 11, wherein the plurality of web pages include web pages dedicated to information and problem report information for system status information monitoring and management.

19. The system, as set forth in claim 11, wherein the plurality of web pages include web pages dedicated to program trace information monitoring and management.

20. A method for monitoring and management of telecommunications equipment in a telecommunications network via the internet, comprising the steps of:

connecting a plurality of user devices to the internet, each user device executing a web browser;

connecting the telecommunications equipment by an intranet to the internet;

accessing a telecommunications equipment by specifying an internet address of a web server residing on the telecommunications equipment; and

downloading a plurality of web pages from the web server via the internet and intranet, the web pages being adapted to display monitor and management information associated with the telecommunications equipment.

21. The method, as set forth in claim 20, further comprising the steps of:

accessing an automatic message accounting server; and

downloading a plurality of web pages dedicated to billing information monitoring and management.

22. The method, as set forth in claim 20, further comprising the steps of:

accessing an information and problem report server; and

downloading a plurality of web pages dedicated to system status information monitoring and management.

23. The method, as set forth in claim 20, further comprising the steps of:

accessing a trace log server; and

downloading a plurality of web pages dedicated to program trace information monitoring and management.

24. The method, as set forth in claim 20, further comprising the step of executing java applets associated with the plurality of web pages, the java applets being downloadable to the user device and executed by the web browser.

25. The method, as set forth in claim 20, wherein the downloading step further comprises the step of downloading a plurality of web pages dedicated to automatic message accounting information monitoring and management.

26. The method, as set forth in claim 20, wherein the downloading step further comprises the step of downloading a plurality of web pages dedicated to system status information monitoring and management.

27. The method, as set forth in claim 20, wherein the downloading step further comprises the step of downloading a plurality of web pages dedicated to program trace information monitoring and management.

FIG. 1

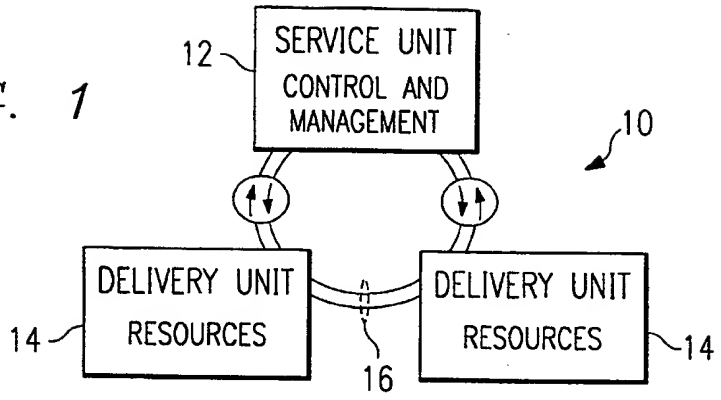
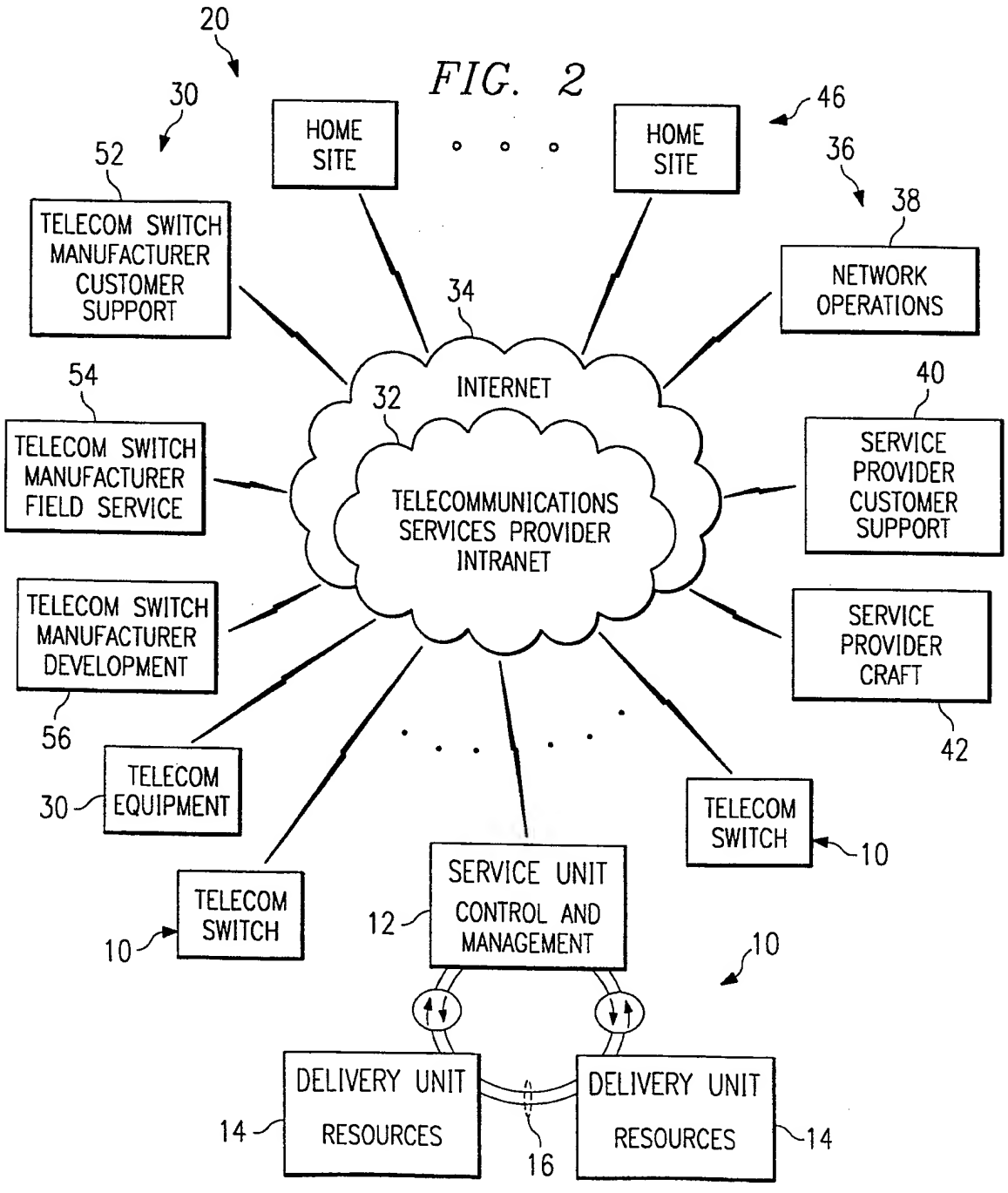

12
SERVICE UNIT
CONTROL AND
MANAGEMENT
10
DELIVERY UNIT
RESOURCES
14
16
DELIVERY UNIT
RESOURCES
14

FIG. 2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30
52
TELECOM SWITCH
MANUFACTURER
CUSTOMER
SUPPORT
HOME
SITE
HOME
SITE
46
36
38
NETWORK
OPERATIONS
34
INTERNET
32
TELECOMMUNICATIONS
SERVICES PROVIDER
INTRANET
54
TELECOM SWITCH
MANUFACTURER
FIELD SERVICE
40
SERVICE
PROVIDER
CUSTOMER
SUPPORT
TELECOM SWITCH
MANUFACTURER
DEVELOPMENT
56
SERVICE
PROVIDER
CRAFT
42
30
TELECOM
EQUIPMENT
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SWITCH
10
10
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RESOURCES
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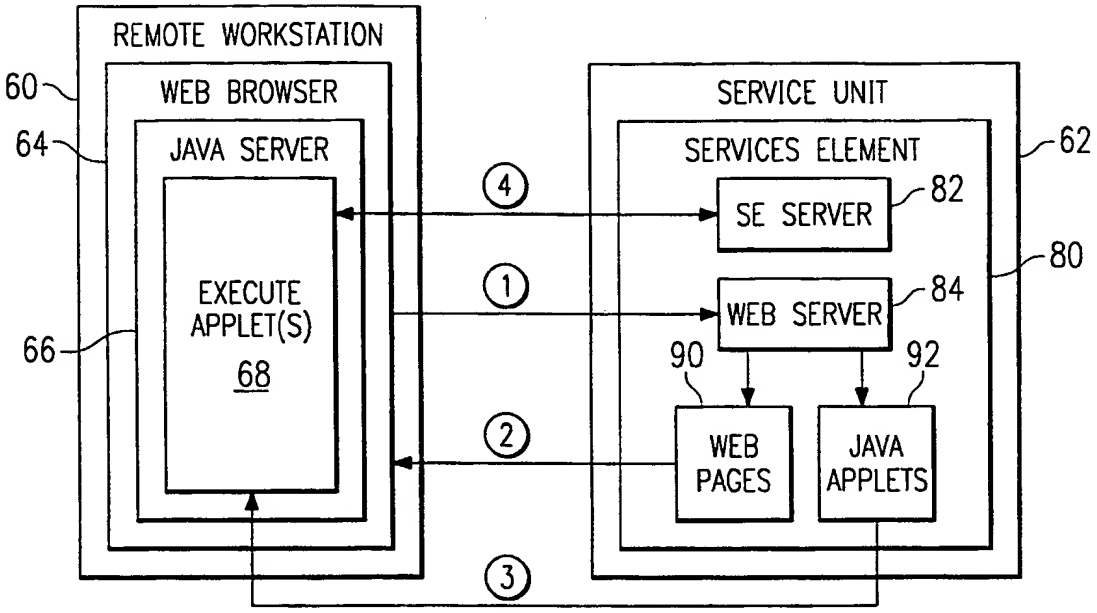
REMOTE WORKSTATION
60
WEB BROWSER
64
JAVA SERVER
EXECUTE APPLET(S)
68
66
SERVICE UNIT
SERVICES ELEMENT
62
SE SERVER
82
80
WEB SERVER
84
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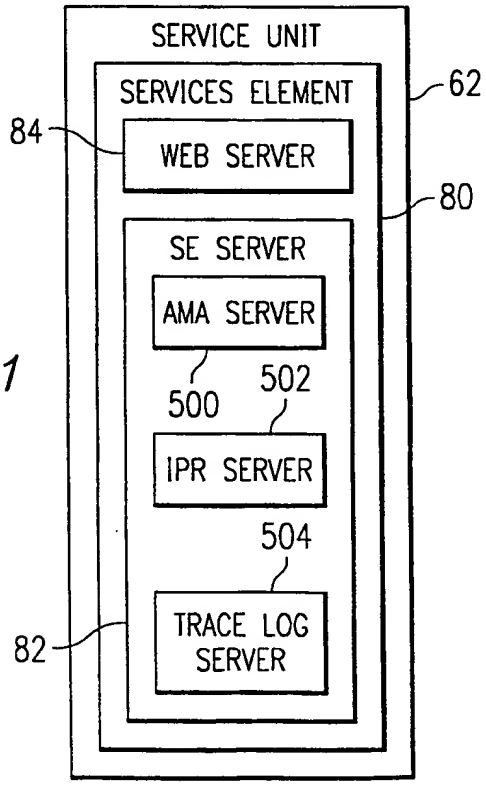
92
WEB PAGES
JAVA APPLETS
1
2
3
4

FIG. 3


SERVICE UNIT
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IPR SERVER
504
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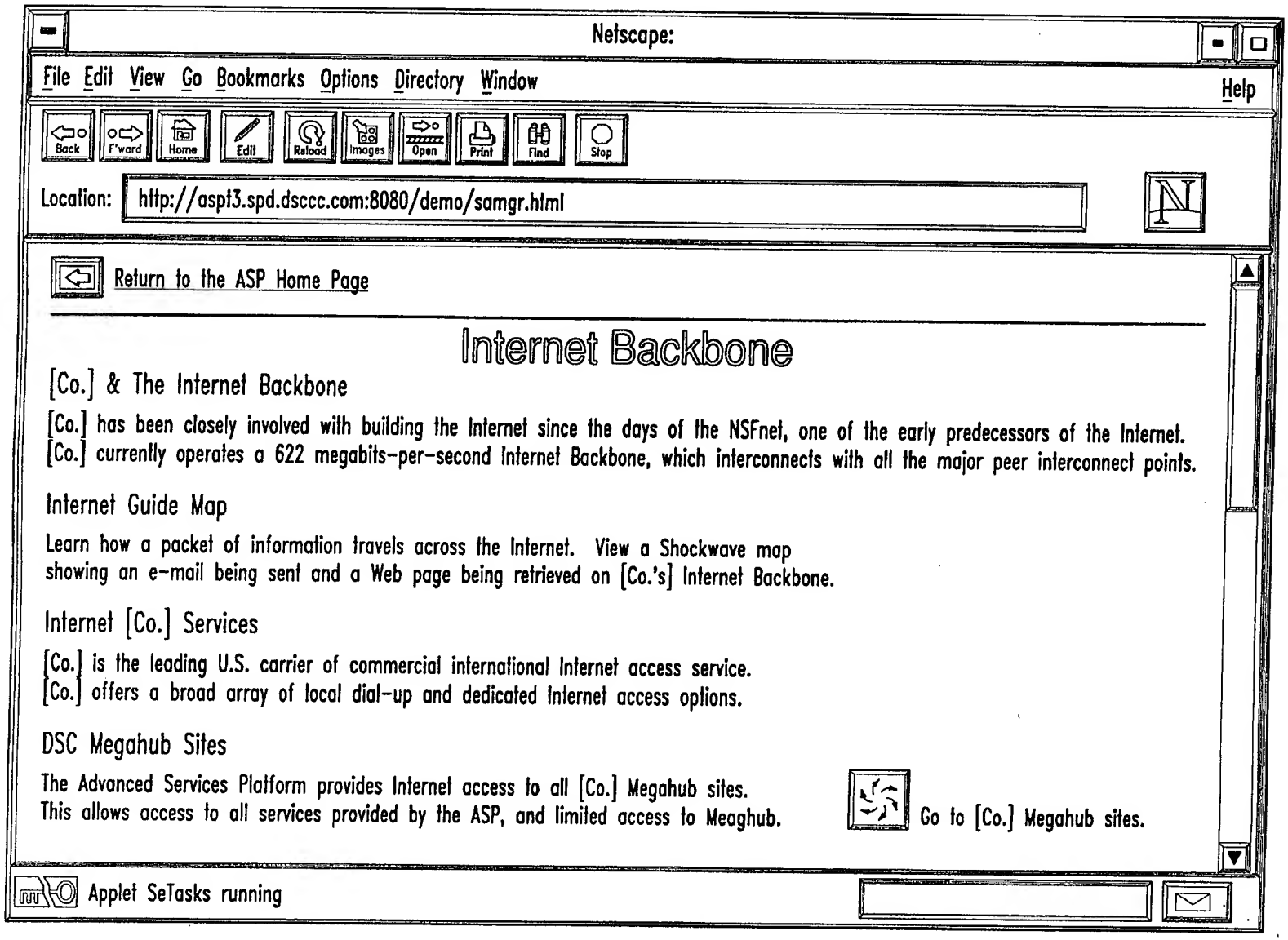
TRACE LOG SERVER

FIG. 11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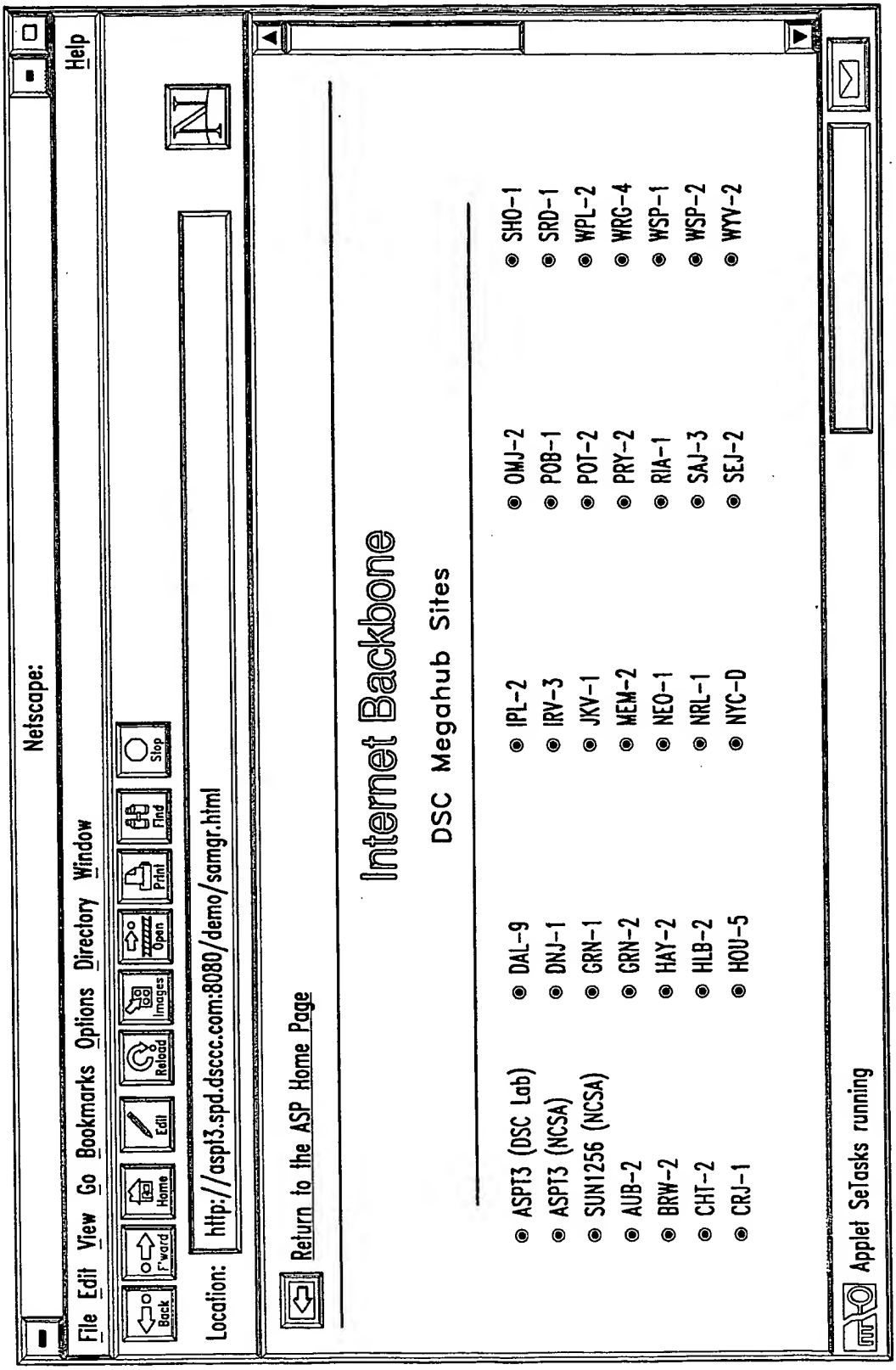
File Edit View Go Bookmarks Options Directory Window
Help
Back
F'ward
Home
Edit
Reload
Images
Open
Print
Find
Stop
Location: http://aspt3.spd.dsccc.com:8080/demo/samgr.html
Return to the ASP Home Page
Internet Backbone
[Co.] & The Internet Backbone
[Co.] has been closely involved with building the Internet since the days of the NSFnet, one of the early predecessors of the Internet.
[Co.] currently operates a 622 megabits-per-second Internet Backbone, which interconnects with all the major peer interconnect points.
Internet Guide Map
Learn how a packet of information travels across the Internet. View a Shockwave map showing an e-mail being sent and a Web page being retrieved on [Co.'s] Internet Backbone.
Internet [Co.] Services
[Co.] is the leading U.S. carrier of commercial international Internet access service.
[Co.] offers a broad array of local dial-up and dedicated Internet access options.
DSC Megahub Sites
The Advanced Services Platform provides Internet access to all [Co.] Megahub sites.
This allows access to all services provided by the ASP, and limited access to Meaghub.
Go to [Co.] Megahub sites.
Applet SeTasks running

FIG. 4

FIG. 5


Netscape:
File Edit View Go Bookmarks Options Directory Window Help
Back Forward Home Edit Reload Images Open Print Find Stop
Location: http://aspi3.spd.dsccc.com:8080/demo/samgr.html
Return to the ASP Home Page
Internet Backbone
DSC Megahub Sites
ASPT3 (DSC Lab)
ASPT3 (NCSA)
SUN1256 (NCSA)
AUB-2
BRW-2
CHT-2
CRJ-1
DAL-9
DNJ-1
GRN-1
GRN-2
HAY-2
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HOU-5
IPL-2
IRV-3
JKV-1
MEM-2
NEO-1
NRL-1
NYC-D
OMJ-2
POB-1
POT-2
PRY-2
RIA-1
SAJ-3
SEJ-2
SHO-1
SRD-1
WPL-2
WRG-4
WSP-1
WSP-2
WYV-2
Applet SeTasks running

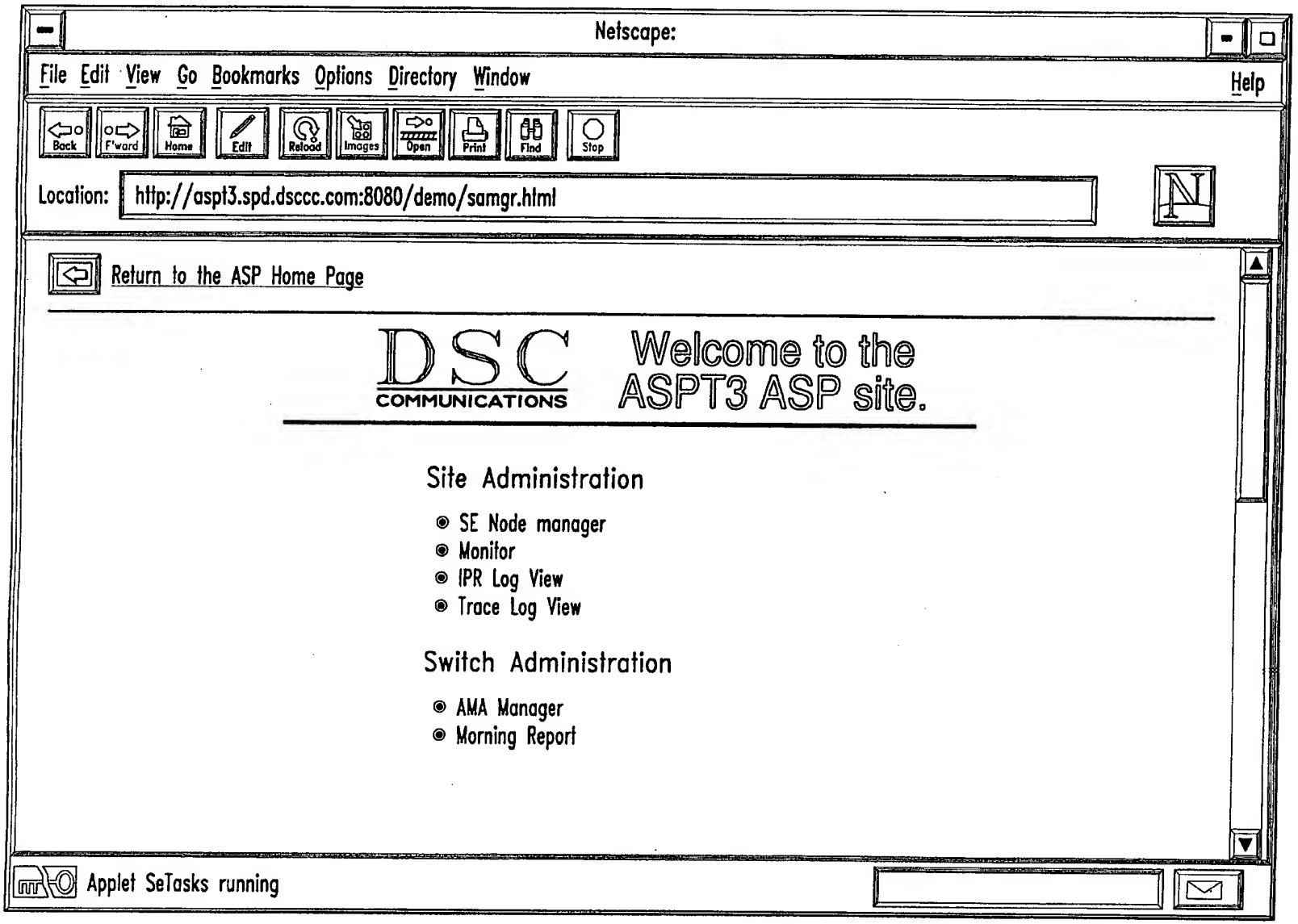

Netscape:
File Edit View Go Bookmarks Options Directory Window
Help
Back
F'ward
Home
Edit
Reload
Images
Open
Print
Find
Stop
Location: http://aspt3.spd.dsccc.com:8080/demo/samgr.html
Return to the ASP Home Page
DSC
COMMUNICATIONS
Welcome to the ASPT3 ASP site.
Site Administration
SE Node manager
Monitor
IPR Log View
Trace Log View
Switch Administration
AMA Manager
Morning Report
Applet SeTasks running

FIG. 6

FIG. 7

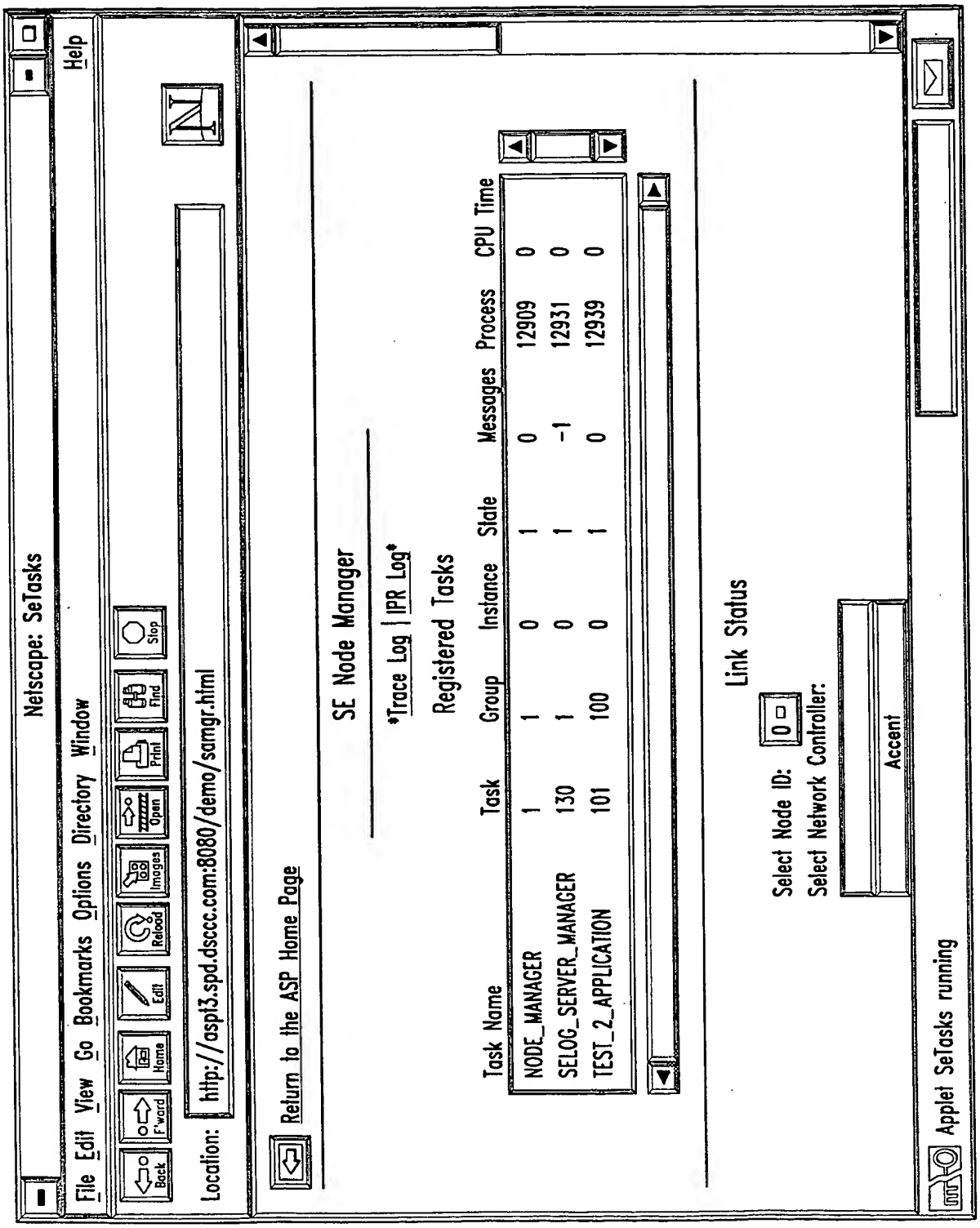

Netscape: SeTasks
File Edit View Go Bookmarks Options Directory Window Help
Back F'ward Home Edit Reload Images Open Print Find Stop
Location: http://aspt3.spd.dsccc.com:8080/demo/samgr.html
Return to the ASP Home Page
SE Node Manager
Trace Log | IPR Log
Registered Tasks
Task Name Task Group Instance State Messages Process CPU Time
NODE_MANAGER 1 1 0 1 0 12909 0
SELOG_SERVER_MANAGER 130 1 0 1 -1 12931 0
TEST_2_APPLICATION 101 100 0 1 0 12939 0
Link Status
Select Node ID: 0
Select Network Controller:
Accent
Applet SeTasks running

FIG. 8

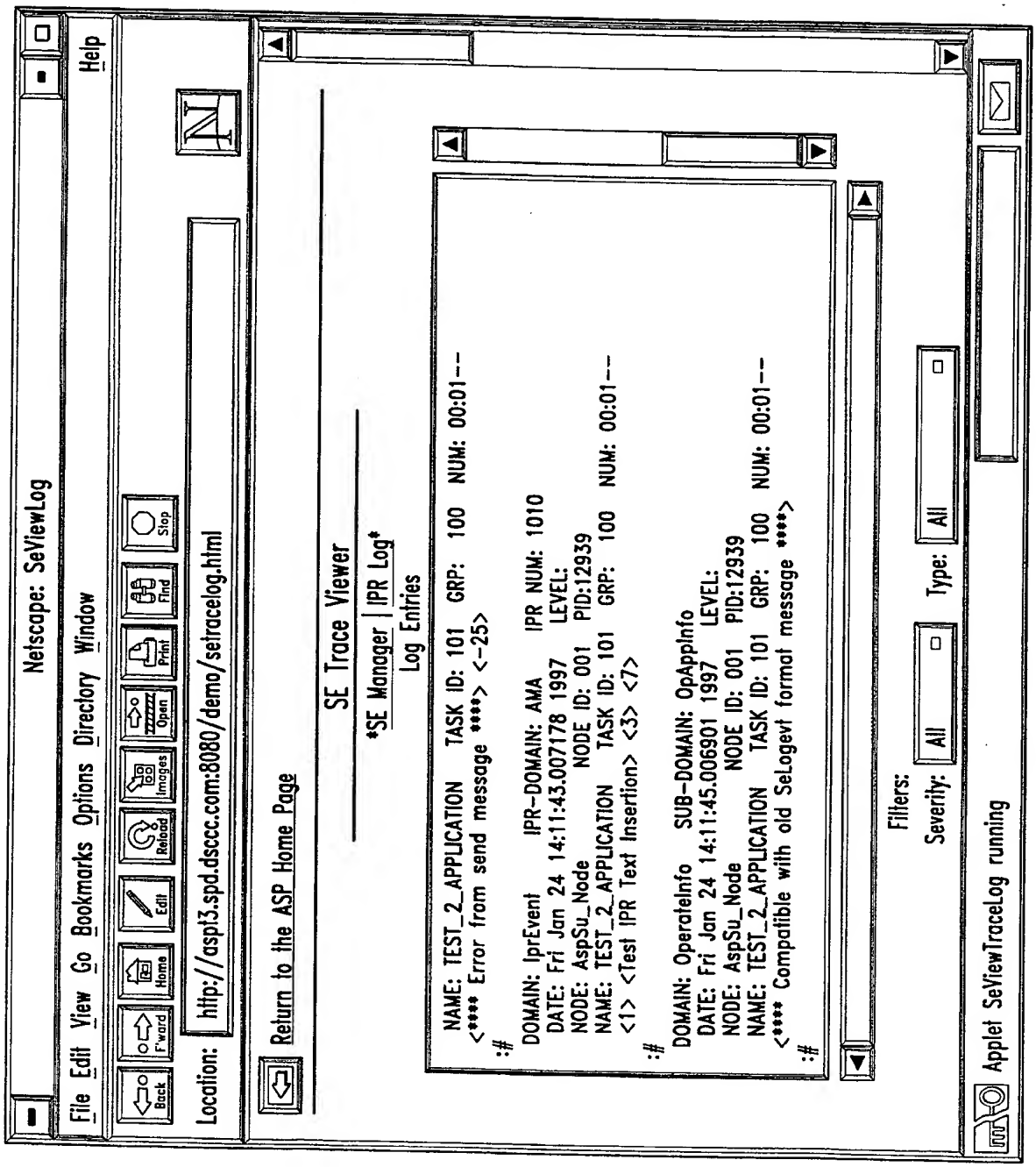
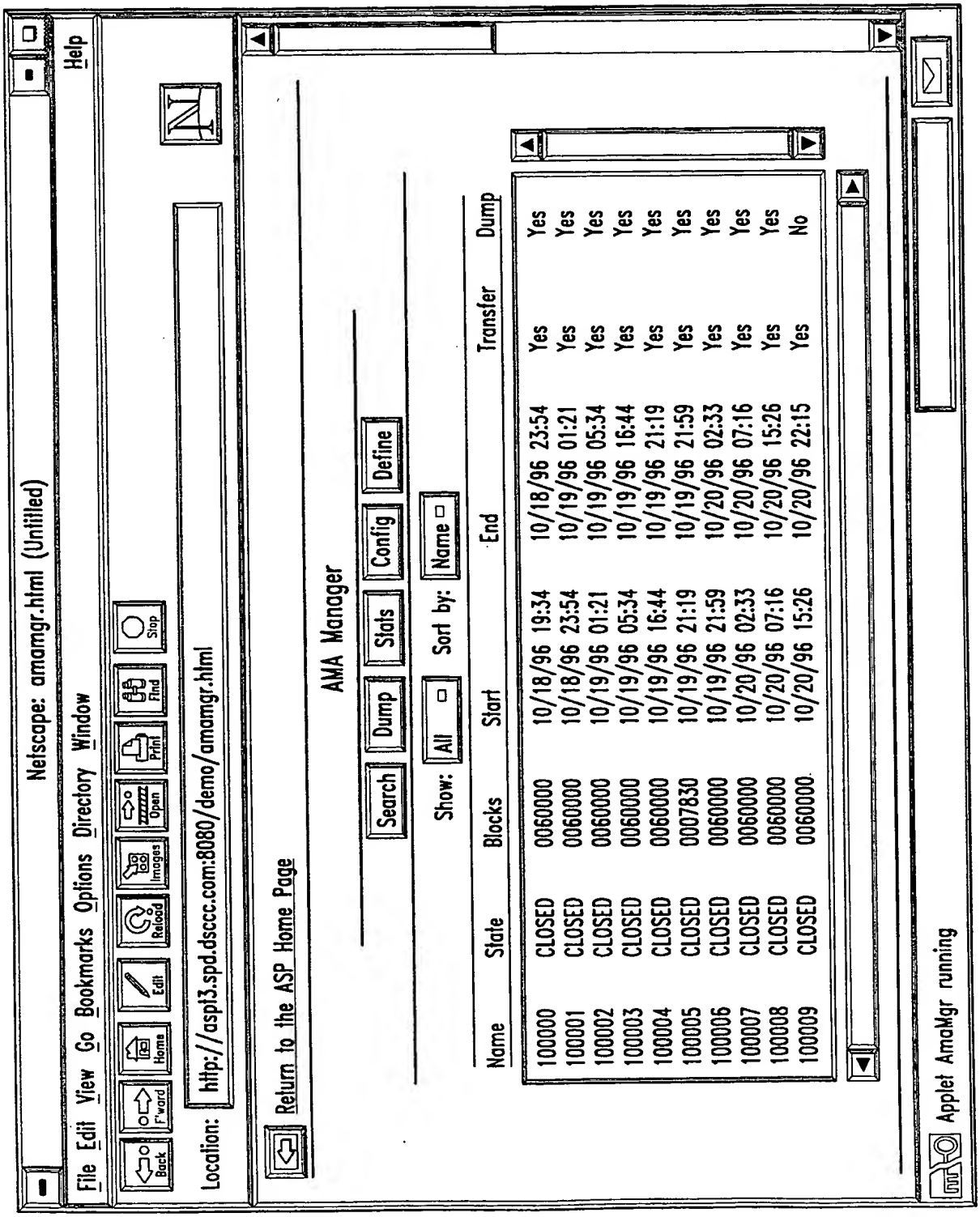

Netscape: SeViewLog
File Edit View Go Bookmarks Options Directory Window Help
Back Fward Home Edit Reload Images Open Print Find Stop
Location: http://aspl3.spd.dsccc.com:8080/demo/setracelog.html
Return to the ASP Home Page
SE Trace Viewer
SE Manager | IPR Log
Log Entries
NAME: TEST_2_APPLICATION TASK ID: 101 GRP: 100 NUM: 00:01--
<**** Error from send message ****> <-25>
:#
DOMAIN: IprEvent IPR-DOMAIN: AMA IPR NUM: 1010
DATE: Fri Jan 24 14:11:43.007178 1997 LEVEL:
NODE: AspSu_Node NODE ID: 001 PID:12939
NAME: TEST_2_APPLICATION TASK ID: 101 GRP: 100 NUM: 00:01--
<1> <Test IPR Text Insertion> <3> <7>
:#
DOMAIN: OperateInfo SUB-DOMAIN: OpAppInfo
DATE: Fri Jan 24 14:11:45.006901 1997 LEVEL:
NODE: AspSu_Node NODE ID: 001 PID:12939
NAME: TEST_2_APPLICATION TASK ID: 101 GRP: 100 NUM: 00:01--
<**** Compatible with old SeLogevt format message ****>
:#
Filters:
Severity: All Type: All
Applet SeViewTraceLog running

FIG. 9


Netscape: amamgr.html (Untitled)
File Edit View Go Bookmarks Options Directory Window Help
Back F'ward Home Edit Reload Images Open Print Find Stop
Location: http://aspi3.spd.dsccc.com:8080/demo/amamgr.html
Return to the ASP Home Page
AMA Manager
Search Dump Stats Config Define
Show: All Sort by: Name
Name State Blocks Start End Transfer Dump
100000 CLOSED 0060000 10/18/96 19:34 10/18/96 23:54 Yes Yes
100001 CLOSED 0060000 10/18/96 23:54 10/19/96 01:21 Yes Yes
100002 CLOSED 0060000 10/19/96 01:21 10/19/96 05:34 Yes Yes
100003 CLOSED 0060000 10/19/96 05:34 10/19/96 16:44 Yes Yes
100004 CLOSED 0060000 10/19/96 16:44 10/19/96 21:19 Yes Yes
100005 CLOSED 0007830 10/19/96 21:19 10/19/96 21:59 Yes Yes
100006 CLOSED 0060000 10/19/96 21:59 10/20/96 02:33 Yes Yes
100007 CLOSED 0060000 10/20/96 02:33 10/20/96 07:16 Yes Yes
100008 CLOSED 0060000 10/20/96 07:16 10/20/96 15:26 Yes Yes
100009 CLOSED 0060000 10/20/96 15:26 10/20/96 22:15 Yes No
Applet AmaMgr running

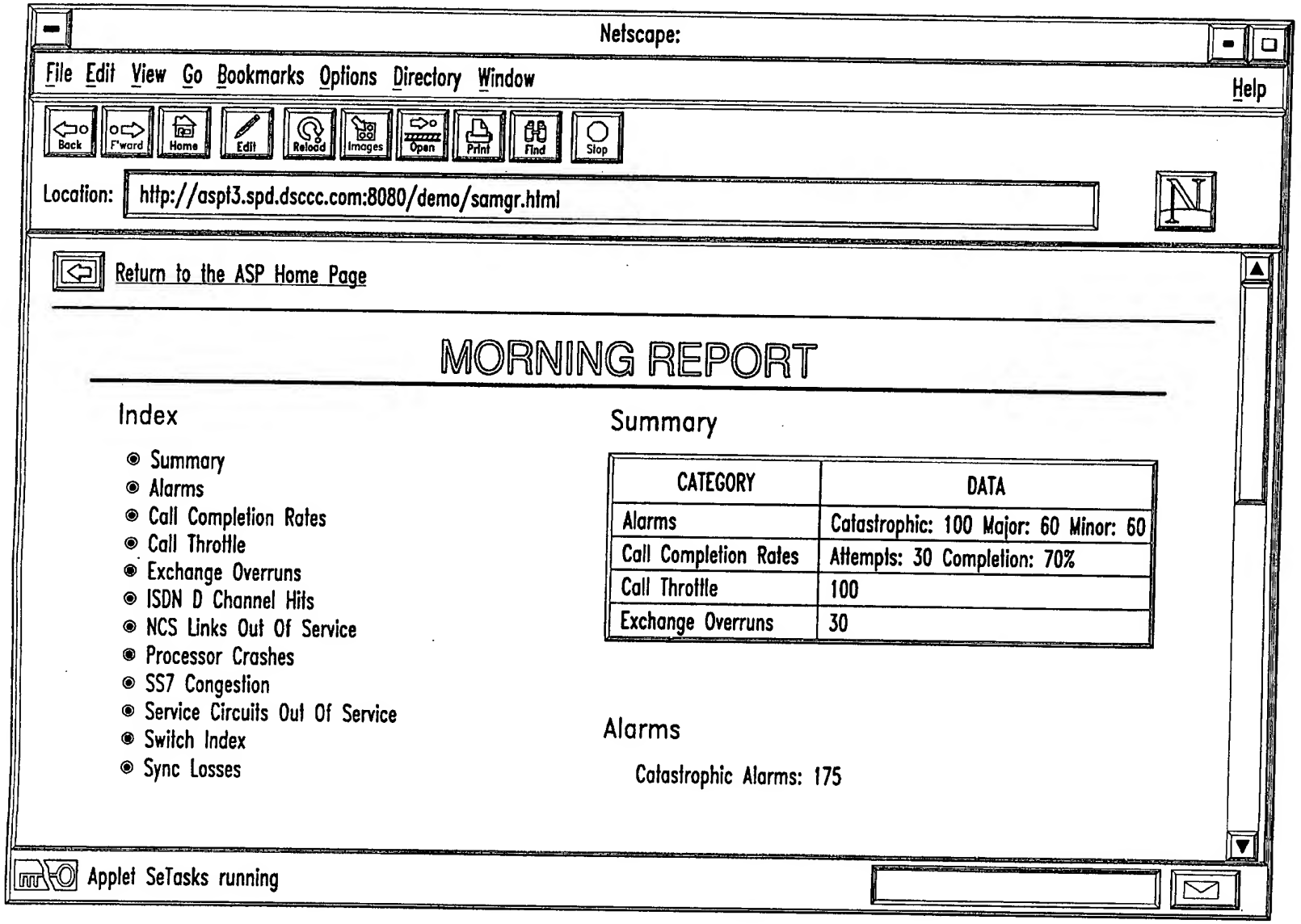

Netscape:
File Edit View Go Bookmarks Options Directory Window
Help
Back
F'ward
Home
Edit
Reload
Images
Open
Print
Find
Stop
Location: http://aspt3.spd.dsccc.com:8080/demo/samgr.html
Return to the ASP Home Page
MORNING REPORT
Index
Summary
Alarms
Call Completion Rates
Call Throttle
Exchange Overruns
ISDN D Channel Hits
NCS Links Out Of Service
Processor Crashes
SS7 Congestion
Service Circuits Out Of Service
Switch Index
Sync Losses
Summary
CATEGORY
DATA
Alarms
Catastrophic: 100 Major: 60 Minor: 60
Call Completion Rates
Attempts: 30 Completion: 70%
Call Throttle
100
Exchange Overruns
30
Alarms
Catastrophic Alarms: 175
Applet SeTasks running

FIG. 10

INTERNATIONAL SEARCH REPORT

	National Application No PCT/US 98/01496

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 H04L12/24 H04L12/14

According to International Patent Classification(IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 H04L H04Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	LARSEN A K: "THE NEXT WEB WAVE: NETWORK MANAGEMENT" DATA COMMUNICATIONS, vol. 25, no. 1, 1 January 1996, page 31/32, 34 XP000545237 see the whole document	1,3-7, 9-11, 13-16, 18-20, 22-24, 26,27
Y		2,8,12, 17,21,25
X	BRUNO L: "LASTING LEGACY: BROWSING BIG IRON ON THE WEB" DATA COMMUNICATIONS, vol. 25, no. 15, November 1996, pages 110-112, 116 - 118, 120, XP000639963 see the whole document	1,11,20

-/--

[X] Further documents are listed in the continuation of box C. [ ] Patent family members are listed in annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
3 June 1998	10/06/1998

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Poggio, F

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Ir ational Application No
PCT/US 98/01496

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication,where appropriate, of the relevant passages	Relevant to claim No.
Y	PENNINO E: "A VISION FOR AN AUTOMATIC MESSAGE ACCOUNTING (AMA) DATA NETWORKING SYSTEM" PROCEEDINGS OF THE NETWORK OPERATIONS AND MANAGEMENT SYMPOSIUM (NOMS), vol. 1, 6 - 9 April 1992, MEMPHIS (US), pages 196-207, XP000344754 see the whole document	2,8,12, 17,21,25
A	LARSEN A K: "WEAVING THE MANGEMENT WEB" DATA COMMUNICATIONS, vol. 25, no. 1, 1 January 1996, page 92, 94 XP000545253 see the whole document	1,11,20
A	HAETOENEN K ET AL: "TASA: TELECOMMUNICATION ALARM SEQUENCE ANALYZER" 1996 IEEE NETWORK OPERATIONS AND MANAGEMENT SYMPOSIUM (NOMS), KYOTO, APR. 15 - 19, 1996, vol. VOL. 2, no. SYMP. 5, 15 April 1996, INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS, pages 520-529, XP000634816 see page 527 - page 528	1,11,20
A	HAMILTON M A: "JAVA AND THE SHIFT TO NET-CENTRIC COMPUTING" COMPUTER, vol. 29, no. 8, August 1996, pages 31-39, XP000632765 see page 35	5,15,24

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